NEWSLINE

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Seismic solutions to complex problems

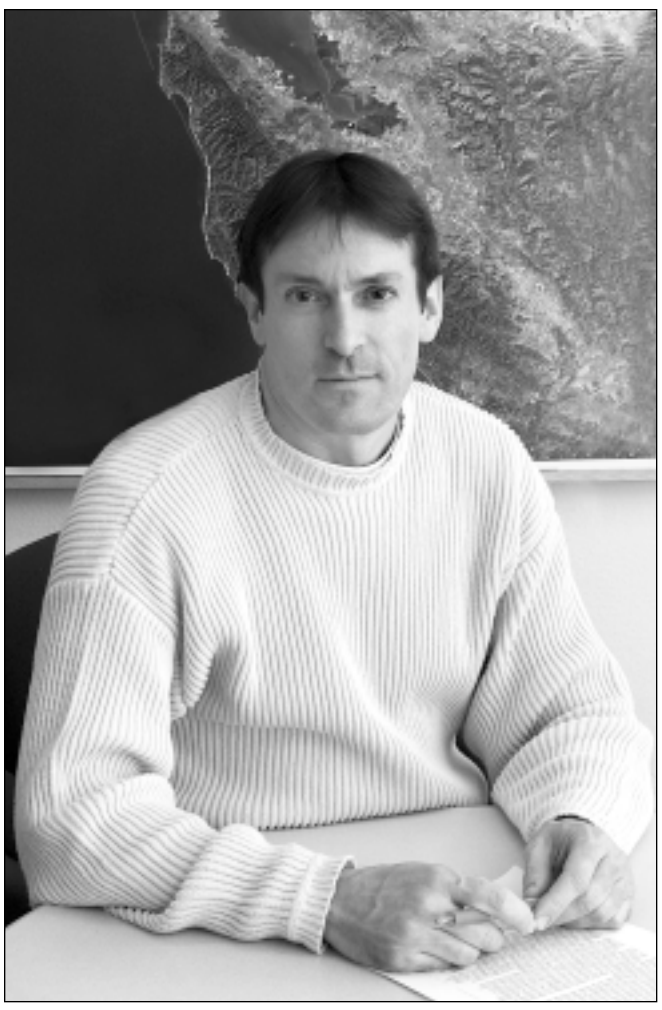
Lab's quake safety efforts on tap for Science Day

By Sheri Byrd
NEWSLINE STAFF WRITER

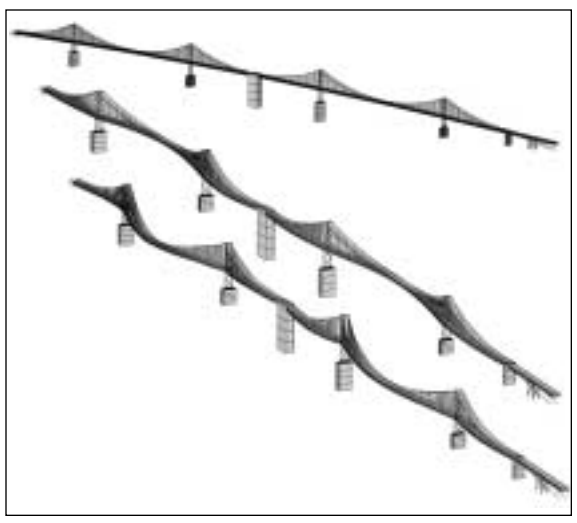
Many observers marveled that the damage to Seattle-area buildings, bridges and roads was not greater after Wednesday's 6.8 earthquake. According to television reports, this was largely due to engineering changes made in the last several years, based on the studies of structural behavior in just such a quake. The new and retrofitted buildings in Seattle did just what they were designed to do — they shook, but did not fall, saving countless lives.

The safety of the nation's skyscrapers, bridges, overpasses and dams during a major earthquake has crossed the mind of just about everyone, especially in the Bay Area. Whether they realize it or not, citizens place their safety in the hands of the engineers who continuously re-evaluate such major structures, trusting them to know what will happen and recommend steps to prevent major disaster.

SCIENCE DAY



JOSEPH MARTINEZ/TID



Dave McCallen heads up Engineering's Center for Complex Distributed Systems, which is using ASCI-level computations to model everything from battlefield simulations to how structures such as bridges will stand up to an earthquake.

Dave McCallen, director of the Center for Complex Distributed Systems in the Lab's Engineering Directorate, has been collaborating with LLNL earth scientists and UC Berkeley faculty in addressing important seismic issues.

"We use the Lab's ASCI-level computation power, together with the most recent methods in wireless sensing and communication, to model and monitor anything from battlefield simulations to structures, such as bridges and buildings, during a major earthquake," said McCallen.

Such application of large-scale computer simulations for understanding earthquake phenomena will be the topic of McCallen's Science Day presentation, Wednesday, March 21, in the Bldg 123 auditorium. Science Day will highlight the Lab's myriad supercomputing capabilities, as well as ongoing scientific and technological research and development in a series of presenta-

See **SEISMIC,** *page 4*

Martha Krebs to discuss the trials and tribulations of managing today's science

In celebration of March as Women's History Month, the Lab Women's Association (LLLWA) is sponsoring two major events.

Martha Krebs, director of the California NanoSystems Institute and former DOE scientist, will give a keynote address, "Managing Science: Oxymoron or Real Life?" The talk will take place at noon Thursday, March 15, in the Bldg 123 auditorium.

Martha Krebs

On Thursday, March 22, LLWA hosts a panel discussion, "Six LLNL Women of Courage and Vision." Lorie Valle of the Affirmative Action and Diversity Program will moderate the discussion with six past and present female Lab employees: Edna Carpenter, Luisa Hansen, Cecilia Larsen, Dorothy Ng, Pam Poco and Faith Shimamoto. Topics include their work at the Lab and their ideas for encouraging young women to choose scientific and technical careers.

Krebs recently moved to UCLA where she is the Director of the California NanoSystems Institute, a collaboration between UCLA and UC Santa Barbara. Gov. Davis announced the establishment of the Institute on Dec. 7, after a competition across the UC system. The institute is a center for multidisciplinary research and education focused on the fabrication of revolutionary materials and useful devices, molecule by molecule. It is committed to innovative collaborations with industry that will accelerate the movement of fundamental knowledge into the marketplace and sustain California's high technology-based economy.

Prior to joining UCLA, Krebs was a senior fellow at the Institute for Defense Analyses, leading studies on research and development policy, budget and management issues.

From 1993 until December 1999, she was director of DOE's Office of Science (formerly Office of Energy Research), one of the largest sponsors of basic research in the federal government. The office funds DOE programs in basic energy sciences, high energy and nuclear physics, biological and environmental research, fusion

See **KREBS,** *page 4*

Technical difficulties hinder production of *Newsline*

This week's issue of *Newsline* is missing some of its regular features. Chalk that up to massive computer problems, resulting in the loss of several files that hindered newspaper production.

Due to these difficulties, the classified ads could not run in today's issue. Ads submitted for today's paper will be posted on the Web. However, to ensure your ad runs in the March 9 edition of *Newsline,* you must resubmit the ad by Tuesday close of business.

If you submitted an item for the Technical Meeting Calendar and it is not included in this week's edition, please call 3-3103.

'Shelter-in-place' newest protective direction

Hazards Controls asks employees and other personnel to be aware of an enhancement to the Laboratory on-site emergency preparedness program.

Most employees are familiar with the protective action direction, "Evacuate to your assembly point." It has been used for several years in annual drills.

The new protective action announcement to be used through the Lab's emergency building speaker system is "Shelter-in-place." The phrase "Shelter-in-place" calls for people to stay indoors (or go indoors), close all doors and windows, and wait for further directions. The direction would be given should there be concerns regarding harmful exposures to materials outside facilities.

"Shelter-in-place is widely used in communities near large chemical plants that have a potential to release hazardous material," said Lab Fire Chief John Sharry. "This type of protection activity operates on research that indicates toxic vapors generally pass over structures without moving inside them. We want to have a similar on-site procedure in place should a situation develop requiring this level of protection."

In the event of an emergency, the Laboratory has established an on-site response system headed by an incident commander. Several factors influence the incident commander's decision to shelter or evacuate, such as weather conditions, type and location of material released and its concentration.

See **SHELTER,** *page 4*

LAB COMMUNITY NEWS

Weekly Calendar

Friday 2

A new session of **dance and fitness classes** offered through LLESA begin Monday. Sign ups are under way in Bldg. 415. Classes will be offered in West Coast swing, East Cost swing, salsa and new beginnings. Cost is $30 per each six-week session. Contact: LLESA, 2-9402.

Wednesday 7

The **Tri-Valley Expanding Your Horizons Conference** is looking for help with packet stuffing. The group will meet from 11 a.m. to 2 p.m. in the mezzanine of Bldg. 905 at Sandia. Pizza and soda will be provided. Contact: Kim Budil, ksbudil@llnl.gov or 3-8098.

Saturday 9

The Lab is hosting a **free tax workshop for foreign nationals** whose tax filing status is non-resident, from 1:30-3:30 p.m. in the Bldg. 123 auditorium. UC Berkeley will offer this workshop for both international employees and visiting international scholars (participating guests, student guests). State and federal non-resident tax forms will be provided, along with information on who needs to complete which tax forms, where to send the forms, the basics of how to fill out the forms and the deadlines. For more information, go to: http://www-r.llnl.gov/human_resources/ RED/ fornat/ fncover1.html

Up & Coming

B Division's spring book sale will return March 12-16, 11:30 a.m. to 1:30 p.m., in Bldg. 132, room 1200 (Q- or L-cleared access only). Used books, videos, CDs and books-on-tape are needed; all proceeds are used to buy Christmas gifts for needy children. Each year the sales help agencies in various places, including Livermore, Fremont, Concord and San Joaquin County, plus individual families in need. A collection box is available in the lobby of Bldg. 132, or call Lynn Groves, 2-1684.

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Six Suspect/Counterfeit Items (S/CI) Workshop sessions are scheduled for Tuesday, March 20 and Wednesday, March 21. Each two-hour session will be repeated daily at 7:30 a.m., 10 a.m., and 1 p.m. in Trailer 2627, room 1020 (Hazards Control Training Center). The S/CI Workshop is intended for procurement personnel, vendors, Technical Release Representatives (TRRs), designers, engineers, construction and receiving inspectors, crafts, and managers of these individuals. The workshop covers the latest information on suspect and counterfeit parts, equipment, components and material found at both LLNL and other DOE sites. The workshop is hands-on and examines actual counterfeit items discovered in the field. There is no cost to attend. Reservations are needed; call Sharon Hoard at 2-1903 and identify which session you wish to attend. Please try to keep reservations or call to cancel or reschedule. Reminder notices will not be sent. Class size is limited to 35 people.

Technical Meeting Calendar

Friday 2

CHEMISTRY & MATERIALS SCIENCE
Post-Doctoral Applicant Seminar: "Synthesis and Characterization of Quaternary Actinide Chalcophosphate Compounds," by Ryan Hess, Los Alamos National Laboratory. 10 a.m., Bldg. 151, room 1209 (uncleared area). Contacts: Patrick Allen, 3-8955, or Joanne Maxwell, 4-4344.

INSTITUTE OF GEOPHYISCS & PLANETARY PHYSICS
"Halo Streams and Field Stars: The Spaghetti Project and Other New Surveys," by Edward W. Olszewski, University of Arizona. Noon, Bldg. 319, room 205. Contact: Joanna Allen, 3-0621.

Monday 5

UC DAVIS, DEPARTMENT OF APPLIED SCIENCE
"Inner Space /Outer Space: Quarks to Cosmology," by Frank Graziani, physicist, Computational Physics/B Division. 4 p.m., Bldg. 661 (Hertz Hall), room 7 (open area). Refreshments served at 3:30 p.m. for a "meet the speaker" session before the seminar and at 5 p.m. after the seminar. Contact: Estelle Miller, 2-9787.

CHEMISTRY & MATERIALS SCIENCE
"Multidimensional Femtosecond Spectroscopies of Molecular Aggregates and Polypepetides," by Shaul Mukamel, University of Rochester. 10 a.m., Bldg. 151, room 1209 (uncleared area). Contacts: Larry Fried, 2-7796, or Christina Quin, 2-8050.

Tuesday 6

CENTER FOR GLOBAL SECURITY RESEARCH
"Should the U.S. Engage in Nation-Building? The Effectiveness of Civil-Military Operations," by Karen Guttieri, SSHRC postdoctoral fellow, Center for International Security and Cooperation, Stanford University. 10 a.m., Bldg. 132S, room 1784. Contact: Tami Alberto, 2-5969.

LIVERMORE COMPUTING
Livermore Computing will hold its monthly customers meeting from 9:30-11 a.m. in Bldg. 451, White Room (uncleared area). Contact: Theresa Delpha, 3-7329.

PHYSICS COLLOQUIUM
"Electronic Structure of Matter: Wave Functions and Density Functionals?" by Walter Kohn, UC Santa Barbara. 10 a.m. Bldg. 361 auditorium. Contact: Giulia Galli, 3-4223, or Darlene Klein, 4-4844.

Wednesday 7

INFORMATION SCIENCE & TECHNOLOGY
"Semiconductor Quantum Dots: Physics in the Transition Between Molecules and Crystalline Solids," by Victor I. Kimov, LANL. 1 p.m., Bldg. 361 auditorium. Contacts: Bernice Wootton, 3-8578.

MATERIALS RESEARCH INSTITUTE
"Nanoparticles and Metal Oxides in CMP," by Hong Liang, University of Alaska, Fairbanks, 3:30 p.m., Bldg. 219, room 163 (open area). Contact: John Molitoris, molitoris1@llnl.gov, or Miriam Rinnert, rinnert1@llnl.gov.

Thursday 8

H DIVISION PHYSICS & ADVANCED TECHNOLOGIES
"High Pressure-High Temperature (HPHT) Synthesis of Novel Oxides and High Dielectric Perovskites," Jae-Hyun Park, Ohio State University. 10:30 a.m., Bldg. 319, room 205 (open area). Contacts: Choong-Shik Yoo, 2-5848, or Donna Vercelli, 2-0976.

PHYSICS & ADVANCED TECHNOLOGIES
"Leptoquarks and Technicolor: Results from CDF," by Richard Haas, University of Florida. 11 a.m., Bldg. 211, room 227 (uncleared area). Contacts: Doug Wright, 3-2347, or Pat Smith, 2-0920.

Friday 9

INSTITUTE OF GEOPHYSICS & PLANETARY PHYSICS
"Gamma-Ray Bursts: The Afterglow Revolution," by Titus Galama, CalTech. Noon, Bldg. 319, room 205 (open area). Contact: Joanna Allen, 3-0621.

IN MEMORIAM

Fred Sass

Fred Sass of the Procurement & Materiel Department died while vacationing in Canada on Feb. 25. Sass had been employed as a subcontract administrator since 1989.

Services will be held at 2 p.m. today (March 2) at Oakmont Memorial Park, 2099 Reliez Valley Road, Lafayette.

Sass had been assigned to provide procurement support to the National Ignition Facility (NIF). Recently he received two awards for his efforts in crafting a unique and successful contracting approach for the Integration Management and Installation contract, which is NIF's largest contract. He had received several letters of commendation for his procurement work throughout his career at the Lab.

Sass previously held positions within P&M as a policy analyst, group leader and subcontract administrator assigned to O Division. Before coming to LLNL, Sass was employed as a senior contract specialist by the Department of Energy and as a contract negotiator with the U.S. Small Business Administration.

Because of his technical abilities, his peers and programmatic customers held Sass in high regard. Regardless of how busy he was, Sass always had time to strategize and help others devise solutions to difficult procurement problems. His many friends at LLNL and DOE will miss him.

He is survived by his brother, Roy.

Contributions in his memory may be made to the American Heart Association, 1710 Gilbreth Road, Burlingame, 94010.

Newsline

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AROUND THE LAB

Resolve compatibility issues before using Windows 2000

As new computer software products arrive on the market, large and varied institutions with complex operational and security requirements, like LLNL, are often presented with difficult challenges. The advantages of more advanced interoperability and functionality carry with them the need for careful planning to enable an institution such as ours to make use of these products, and support their use, in a security-conscious and cost-effective way.

This "Statement of Direction" is the first step toward enabling the successful, planned deployment of the Microsoft Windows 2000 architecture at LLNL.

Statement of Direction

This product family consists of Windows 2000 Professional and Windows 2000 Server (including Advanced Server, Datacenter Server and Active Directory). With this statement, the LLNL Information Architecture Advisory Board (see http://www-r.llnl.gov/projects/ia/iaab/iaab.html) recommends that the Windows 2000 product family be installed at LLNL only as one of the following:

- In a standalone configuration
- As a member of a Windows NT 4.0 domain
- In isolated test environments.

Furthermore, LLNL organizations are advised that many software packages are not certified as compatible with Windows 2000 and support staff experience in supporting the product is limited. Therefore, caution should be used before deciding to use Windows 2000 Professional or Server. Because of the complexity of Windows 2000 Active Directory, it is not recommended that organizations with production environments install Windows 2000 Server domain controllers or upgrade existing Windows NT 4.0 servers to Windows 2000 Server until the infrastructure is in place to support it. The full text of this statement of direction is on the web at: http://www.llnl.gov/projects/ia/standards/ia0a02/ia0a02.html.

CIO UPDATE

Dave Cooper

Impact

Windows 2000 Active Directory introduces a fundamental architectural change in the Windows domain structure by providing the services necessary to move the operating system into an enterprise-class service. It provides a wide range of features related to network services and system security.

While it is designed to simplify administration and ease the task of finding resources, the installation of Active Directory can impact the entire network at LLNL and cause conflicts that will hamper the naming and assigning of machine addresses. If Active Directory is installed by an organization and it impacts a significant portion of LLNL, the organization's network connection may have to be shut off until the issue can be resolved. In addition, organizations that choose not to follow the recommendations of this statement of direction are likely to have to completely re-engineer their production Windows 2000 server-based services when a Windows 2000 architecture is ultimately approved for use at LLNL.

Next steps

The current Windows NT infrastructure at LLNL was not planned or implemented by any institutional collaborative group. As a result, information sharing between NT domains has been difficult or impossible. The highly complex Windows 2000 operating system relies heavily on a well-defined infrastructure. Therefore, it is imperative that an institutional infrastructure be developed to ensure the support of programmatic requirements before widespread installation of the complete Windows 2000 architecture, particularly the Active Directory service, at LLNL.

This effort, with active programmatic participation, is well under way, and testing has begun on an architectural model. The project plan calls for the preliminary design to be available for comment by August and a final design completed in October.

Again, the goal is to enable LLNL users to take full advantage of the many promising institution-wide capabilities of the Windows 2000 operating system and to avoid the pitfalls we experienced with the ad hoc introduction of the current Windows NT architecture at LLNL. Organizations who follow this statement of direction are assured that their computer systems will be compatible with the Lab-wide architecture when it is deployed.

David Cooper is associate drector for Computation as well as LLNL's Chief Information Officer.

Science on Saturday airs blow-by-blow on the wind

The Lab's Science on Saturday series will feature a talk tomorrow on "What Makes the Wind Blow? — Using Computers to Understand the Atmosphere," from 9:30 to 11:15 a.m. in the Bldg. 123 auditorium.

Ron Baskett, Mike Bradley and Jim Ellis of the Lab's National Atmospheric Release Advisory Center and Granada High School teacher Susan Johnston will offer an introduction to the forces that cause and affect the wind in the atmosphere.

Their talk will describe the Lab's tools to predict the wind and the path of hazardous material released into it. They will explain NARAC's capability to warn people and assess the health consequences of hazardous releases.

Science on Saturday is a six-week series of free 90-minute talks geared toward middle and senior high school students.

The lectures will continue every Saturday through March 24, from 9:30 to 11:15 a.m. All of the talks are in the Bldg. 123 auditorium, and are open to students, their parents or guardians and teachers. Registration is at the door and seating is available on a first-come, first-served basis.

The series is co-sponsored by the Laboratory's Science & Technology Education Program and the Livermore chapter of Sigma Xi, the Scientific Research Society.

Starting tomorrow and continuing for the next three Saturdays, additional workshops for grades 6-8 teachers will be added to the Science on Saturday lectures. The teacher workshops will expand on the lecture with the aid of Great Explorations in Math and Science (GEMS) class-room guides and materials.

The four workshops will be held at the Lab Visitors Center from 8 a.m. to 3:30 p.m. Teachers who attend all four are also eligible for two semester units of credit.

Teachers should register with Liselle Clark (clark87@llnl.gov, 2-5468) or Paula Thomson (209-468-9096).

Join your co-workers in fighting cancer

Purchase a bunch of freshly cut daffodils (10 stems) for $10. A vase is available for an additional $5.

Money from this American Cancer Society-sponsored event will go to research, education and patient services.

The deadline for an LLNL order is **Friday, March 9.**
Delivery will be on **Monday, March 26.**

Check the list below for the LLNL Daffodil Days volunteer nearest you who is accepting orders.

Name	Bldg.	Rm.	Phone	Name	Bldg.	Rm.	Phone
Bell, Christine	381	1356A	3-9447	Mahler, Florann	551E	2101C	2-9173
Berkich, Tracy	071	1020	2-8246	Miller, Margie	315	285	3-0269
Bertram, Sharon	261	1408	2-5853	Pereira, Kris	871	124	3-5245
Bishop, Sue	321A	1020C	2-9593	Pierce, Sue	2679	1269	3-1094
Breznik, Joanne	616	100	4-4101	Purpura, Gloria	1878	104	2-7281
Carter, Karen	234	1020	3-5934	Quick, Bonnie	451	2005	2-6510
Carter, Marilyn J.	1877/1879	126	2-7715	Riendeau, Misty	5979	100	2-9521
Cochran, Loretta	253	1524	2-0964	Rodrigues, Lei Loni	131	2088	2-0654
Conrad, Janet	218	119	2-7561	Rutan, Dena	482	2234A	3-1813
Continente, Jenifer	113	5024	2-6644	Schleich, Dabbie	132N/151	2841	2-1241
Copp, Kathy	235	2070	4-2597	Schmidt, Sharon	663	1000	2-7459
Crippen, Terri	5477	1042	3-9878	Sefcik, Cookie	3226	104	3-2242
Curtis, Leslie	132N	1489	2-0217	Serrato, Martha	3725	437	2-5116
DaRonco, Dawn	331/335	1029	2-6649	Shuler, Jean	113	1030	3-1909
Dewolf, Chris	543	1281	3-8348	Simmons, Mag	191	2123B	2-3364
Fread, Lanette	411	1422	2-9288	Springer, Frankie	111	332	3-6192
Gagetta, Rita	111	501	3-1161	Sorensen, Nanette	2925	101	2-9670
Garrett, Liz	1406	1117	3-2482	Taberna, Sharon	361	1741	4-2263
Gonsalves, Sandi	170/1739	2112	3-8821	Twiss, Carol	571/671	1138	2-9395
Grandfield, Charlene	5475	1359	3-1779	Watt, Maggie	332	1138	3-6003
Gros-Baumgartner, Bertie	121	1103	3-7751	Weyburn, Sandy	511	203D	2-0840
Jessup, Mary	231	1236	3-1760	Williams, Anita	132N	2254	2-4550
Jimenez, Irene	511	213	3-1273	Ybarra, Corinne	481	2075A	3-9501
Lindsay, Karen	432	2003	4-4371	Yazzie, Darlene	132S	2121	3-7846

THE BACK PAGE

Celebrating Chinese New Year

DON JOHNSTON/PUBLIC AFFAIRS

Joel Wong of Hazards Control (left) presented Director Bruce Tarter with a Dragon Boat T-shirt as part of the Chinese American Networking Group's annual luncheon celebration of Chinese New Year. Wong kicked off the celebration by giving a brief introduction on 4699, the Year of the Snake. Those born under the snake years are "endowed with tremendous wisdom and prefer to rely on their own intellect rather than trust the judgment of others." Both Tarter and recently retired Deputy Director of Operations Bob Kuckuck also spoke on the values of diversity.

SEISMIC

Continued from page 1

tions. (For more information, see the Website at http:// http://stars.llnl.gov/ScienceDay/.)

McCallen and his colleagues from the Energy and Environmental Sciences Directorate have recently completed a Campus Laboratory Collaboration project with UC Berkeley faculty to investigate the seismic response of long-span bridge structures, specifically the behavior of the Oakland Bay Bridge in a large earthquake.

"We create a virtual environment for an accurate 'what-if game' for future earthquakes," explained McCallen. "The benefit of such large-scale modeling is to avoid the painful lessons learned by studying structural failures after an earthquake. In such instances, (engineering) mistakes kill people. The more accurately we can model, the fewer mistakes there will be."

With respect to earthquakes, this means taking data from actual structural vibrations, in order to understand the dynamics of a particular structure, and constructing large-scale computer models. Small earthquakes happen frequently in the Bay Area, providing the real-time data, which, used in ASCI-level computations with the LLNL-developed E3D code, give an accurate capability to predict ground motion and structural response.

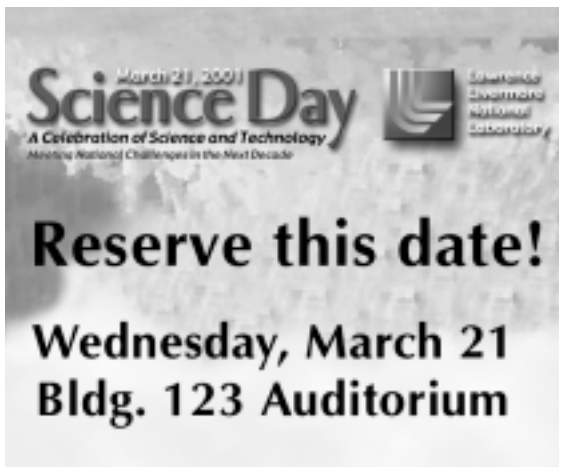
"Recent scientific studies indicate a high probability that a major Bay Area earthquake will occur within the next 30 years," said McCallen. "Field measurements of ground motions and structural response in actual past earthquakes have illustrated the complex variability of earthquake ground motions and the complicated manner in which structures vibrate during earthquakes. The complexity of the phenomena provides engineers and earth scientists with a real technical challenge in trying to predict what will occur during future earthquakes.

"Advanced simulations can provide us with the knowledge base necessary to design the safest structures in the most cost-effective way," said McCallen.

Recently, the center's focus has been on the seismic integrity of DOE facilities, as well as consulting with other government organizations such as Caltrans, for California bridges and overpasses, and the U.S. Bureau of Reclamation, regarding the nation's dams.

LLNL scientists and engineers are highly practiced at their specialty. "We've been at this for quite a while," said McCallen. "LLNL helped create the seismic safety criteria for the Nuclear Regulatory Commission for the first nuclear plants in the 1970s."

For more information on the center's work, see these Websites: http://www-eng.llnl.gov/eng_llnl/01_html/eng_ctrcompdistsys.html, http://www.llnl.gov/str/McCallen.html or http://www.llnl.gov/hmc/index.html.



For a complete list of Science Day presentations, along with abstracts, see the Website at http://stars.llnl.gov/ScienceDay/

SHELTER

Continued from page 1

"These factors, collectively known by trained incident commanders as 'on-scene indicators,' are part of the decision-making process that occurs at every emergency scene," said Sharry.

Sharry asks employees to remember the following if they hear the "Shelter-in-place" announcement:

- Shelter — Stay inside your building or go inside the nearest building.
- Shut — Close doors and windows.
- Listen — Listen for further instructions over the emergency page system or Laboratory Emergency Radio, 1610 AM. Avoid using the telephone unless you have a life-threatening emergency.

The Laboratory will conduct its annual sitewide emergency preparedness exercise the week of April 23. The "Shelter-in-Place" announcement may be used during the drills. Additional information will be provided to directorate Assurance Managers and communicated Labwide prior to the exercise.

For more information on Shelter-in-Place or other self-help activities, contact the Emergency Management Division at 3-1810.

KREBS

Continued from page 1

energy sciences, advanced scientific computing research and science education.

In addition, Krebs served as DOE's Science and Technology adviser. She advised the secretary on science and technology issues that cut across DOE programs; on the transfer of technology from DOE laboratories to industry, on science education and training activities, and on the management of the department's laboratories. She was also responsible for the management of DOE's five multiprogram and 10 single-program non-weapons laboratories.

From 1983 until she joined DOE, Krebs was associate laboratory director for Planning and Development at the Lawrence Berkeley Laboratory. She was responsible for a strategic scientific program planning process, and for technology transfer planning and policy development. She also established the laboratory's Center for Science and Engineering Education, which provides collaborative research experiences for students, teachers, and UC faculty.

Krebs earned an A.B. and a Ph.D. in Physics from the Catholic University of America. Her field of research was statistical mechanics. She is a National Science Foundation Fellow and American Association for Advancement of Science Fellow.

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